



Information Science and Technology Center Seminar



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"Iterative Bias Reduction for Multivariate Smoothers"

Wednesday, March 31, 2010
3:00 - 4:30 PM

TA-3, Bldg. 1690, Room 102 (CNLS Conference Room)

Abstract: We present a general procedure for nonparametric multivariate regression smoothers that outperforms existing procedures such as MARS, additive models, projection pursuit or L_2 additive boosting on both real and simulated datasets. In multivariate nonparametric analysis, sparseness of the covariates also called curse of dimensionality, forces one to use large smoothing parameters. This leads to biased smoother. We still propose to use classical nonparametric linear smoother, such as thin plate splines or kernel smoothers, but instead of focusing on optimally selecting the smoothing parameter, we fix it to some reasonably large value to ensure an over-smoothing of the data. The resulting (base) smoother has a small variance but a substantial bias. Afterward, we propose to iteratively correct the biased initial estimator by an estimate of the bias obtained by smoothing the residuals. In univariate settings, we relate our procedure to L_2 -Boosting. Rules for selecting the optimal number of iterations are also proposed and, based on empirical evidence, we propose one stopping rule. In the regression framework, when the unknown regression function m belongs to the Sobolev space $\mathcal{H}^{(\nu)}$ of order ν , we show that using a thin plate splines base smoother and the proposed stopping rule leads to an estimate \hat{m} which converge to the unknown function m . Moreover, our procedure is adaptive with respect to the unknown order ν and converge at the minimax rate. We apply our method to both simulated and real data and show that our method compares favourably with existing procedures such as MARS, additive models, L_2 boosting or projection pursuit, with improvement on mean squared error up to 30%. A R package is available.

Biography: Professor Matzner received his PhD in Statistics at the Univ. Montpellier 2 in 1997 and then joined the faculty of the University of Haute Bretagne in Rennes. He was promoted to full professor in Statistics in 2007.

He was the editor of the Press Universitaire de Rennes and is now the editor of the Springer collection PratiqueR. He is the author of two books: Regression: theory and applications Statistics with R.

Professor Matzner has worked on numerous applied and industrial statistics problems, including ozone concentration predictions, prediction of electrical consumption and classification of curves for assessing the quality of cheeses.

